CASE SERIES

Clinical and functional outcomes following platelet rich plasma in the management of knee osteoarthritis: A case series in a tertiary care hospital

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Abstract

Objective: To clinically assess the efficacy of Platelet rich Plasma (PRP) in improving the functional movement in knee osteoarthritis.

Methods: This prospective case series, on 89 patients, was studied in Sindh Rangers Hospital, Karachi, Pakistan from 1st October 2018 to 31st March 2019. The analysis involved all patients aged 30-65 years diagnosed with grade 1, 2 and 3 arthritis. PRP was administered in three doses one month apart, and patients were evaluated for outcome measures after the third month of the third dose of PRP. To measure functional improvement in knee osteoarthritis, the range of motion (ROM), McMaster University Osteoarthritis index (WOMAC), Western Ontario, and Visual analogue scale (VAS) were used.

Results: PRP was infused into 89 patients, with a mean age of 61.24±8.92 years. The average pre-treatment WOMAC score was 37.0 ±2.9, and it was lowered to 18.8± 5.2 after PRP ($p<0.02$). The pre-treatment VAS was 8.42 ±0.84, and it was reduced to 4.91±2.12, indicating mild to moderate pain. Our PRP therapy was appreciated by 63 (70.07%) patients, while 17 (19.1%) were only partly satisfied. However, 9 (10.1%) patients were dissatisfied.

Conclusion: The results of this case series showed that the use of PRP injections for treating osteoarthritis (grade 1 to 3) proved to be successful in terms of improving functional outcomes and reducing pain intensity.

Keywords: Osteoarthritis, Platelet rich plasma, Knee pain, Orthopaedics, Regenerative medicine.

Introduction

Knee osteoarthritis (OA), a progressive degenerative disease of the knee, is caused by the gradual deterioration of articular cartilage. It is one of the top five most debilitating diseases, affecting more than one-third of the elderly population over the age of 65, with worldwide figures reaching more than 100 million people.[1] The incidence of knee OA has risen dramatically in recent decades and continues to grow, owing in part to a spike in the incidence of obesity and other risk factors.[2] Increasing age, past knee fractures and elevated BMI all tend to accelerate the mechanical tension and emerge as the significant risk factors for the development of OA.[3] Unusual behaviour patterns such as prolonged standing, lifting of heavy objects and certain competitive sports are also implicated in the development of OA due to more frequent fractures culminating in defects of the cartilage.[4]

Physical inactivity is also a major contributor to the rising incidence of OA, raising the risk of knee injury due to less robust and weakened joints. However, as opposed to past knee injuries, weakening of the knee extensor muscles seems to be a minor risk factor.[5] OA can have a detrimental effect on people's mental health in addition to their physical health. The Osteoarthritis Initiative (OAI) analysis found that people with lower limb OA have a higher risk of experiencing psychological distress than those who did not have the condition. As a consequence of this mental and emotional anguish, there is further prohibition of daily physical activity which ultimately leads to further knee discomfort and weight gain.[6] There is also a mounting evidence that OA is a contributing factor for the occurrence of cardiovascular disease. According to a meta-analysis, the likelihood of myocardial infarction is tremendously enhanced in OA and other forms of arthritis.[7] Since OA is a debilitating condition with pain as the primary symptom, pain control and dietary changes are ineffective, and the disease is complicated to treat in situations where traditional symptomatic therapy has failed to improve quality of life, joint replacement surgery is the only alternative remaining, rendering knee arthroplasty in OA a breakthrough procedure.[5] However, recent therapeutic interventions such as intra-articular corticosteroid injections, hyaluronic acid injections and platelet-rich plasma (PRP), can also help to delay the progression of the disease.

With recent advancements in the treatment modalities,

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treatment of OA with the application of PRP has boosted, and its use now has been endorsed by mounting evidence. Obtained from autologous blood, it aids in tissue regeneration and triggers the healing process.[8] PRP can facilitate a favourable environment for joint tissue healing, according to preclinical evidence.[9] Nonetheless, despite recent reviews showing positive outcomes the use of PRP for the treatment of active patients is still very scant, and more research is required to record potentials and shortcomings in terms of clinical progress in this population.[10,11] In order to clinically assess the efficacy of PRP, we studied this series of patients to determine the functional improvement in osteoarthritis knee treated with platelet-rich plasma in Karachi, Pakistan.

Patients and Methods

This prospective case series was conducted in Sindh Rangers Hospital, Karachi Pakistan from 1st October 2018 to 31st March 2019. The study was approved by Institutional Review Board of Sindh Rangers Hospital and all participants provided the written informed consent. The study duration was 6 months from 1st October 2018 to 31st March 2019.

Patients were recruited based on the following inclusion requirements: Patients between the ages of 30-65 years with bilateral knee osteoarthritis, both gender, positive history with pain/swelling (> 4 months), degenerative finding (X-rays) of joints without significant deformity and Kellgren Lawrence grading classification[12] of grade 1, 2 and 3. However, excluded were patients over the age of 65 years, those who did not provide the informed consent, those with Diabetes Mellitus, a history of knee articular, collagen vascular disorder, malignant disorder, active infection/ wound on knee or nearby area and taking immunosuppressive medications, anti-platelets disorder/ anti-coagulant medication used within the last 10 days, NSAID used within the last 2 days, or systemic corticosteroids used within the last 3 months. Patients with genu valgum (knee > 20 degree), Hepatitis B, C, and HIV/AIDS were also excluded.

Treatment and Evaluation: PRP was prepared by Arthrex ACP® (Autologous conditioned plasma). The unique Arthrex ACP® has double syringe system for non-homologous fluids specifically platelet and growth factor enriched autologous conditioned plasma. The skin was cleaned and sterilized properly and the patella was palpated with gloved hands. A 23-gauge needle was used and injection site was approached superiolaterally in the supine position. 3 mL of PRP was injected in each knee joint. After the injection, a small bandage was applied without compression. All procedures were executed by a single researcher. PRP was given in three doses one month apart and after the 3rd dose patients were assessed for outcome measures.

Prior to the PRP administration, Erythrocyte Sedimentation Rate (ESR) and C - reactive protein (CRP) levels were measured in selected PRP patients (before and after). The purpose of doing these two investigations prior to administration of PRP was to exclude other inflammatory conditions such as Rheumatoid Arthritis (RA). Patients follow up was done after the third month of receiving the third dose of PRP. The range of motion (ROM),[13] Western Ontario and McMaster University Osteoarthritis index (WOMAC)[14] and Visual Analogue Scale (VAS)[15] was used to assess functional change in knee osteoarthritis. WOMAC was used to assess stiffness, discomfort, and normal physical exercise before and after treatment, while Visual Analogue Scale (VAS) was used to measure pain before and after therapy. Patient satisfaction was assessed by simply asking as to "how much are you satisfied with your treatment?" with options satisfied, partially satisfied and not satisfied.

The sample size was determined by estimating a population proportion by WHO calculator[16] with confidence interval of 95%, absolute precision 0.05 with anticipated population proportion. The calculated sample size was 93. Due to the loss to follow up and denial of consent from patients, the selected study population reduced to 89. SPSS v. 21 was used to analyse the data. Frequencies and percentages were included to express descriptive figures. The significance level was determined using a paired t-test. P>0.05 was regarded as statistically significant.

Results

A total of 89 patients with the mean age of 61.24±8.92 years were injected PRP. Overall, 37 (41.6%) patients were male and 52 (58.4%) were females with 65 (73%) belonging to Urban and 24 (27%) to rural regions of the country. Other demographic variables like weight and BMI are shown in the Table.

There was no statistically significant difference between inflammatory markers (ESR and CRP) of pre and post PRP with P value = 0.32. The laboratory findings are shown in Table. According to KL grading, 28 patients had grade 1 OA, 39 had grade 2 and 16 patients were in grade 3.

The mean flexion for right knee was 110.23±4.5 degrees and 112.35±3.4 degrees for left knee before PRP injection,

Table: Baseline characteristics of PRP population.

Baseline characteristics	All patients (N = 89)	Male N(%) = 37 (41.6)	Female N(%)=52 (58.4)
Age (years)			
Mean ± SD	61.24 ± 8.92	60.17 ± 10.82	60.16 ± 10.61
Median (range)	61 (41)	61(72)	61(72)
Weight (kg)			
Mean	81.60 ± 13.92	80.38 ± 15.82	80.26± 15.63
Median (range)	80.5 (70)	80.25 (102.08)	80.25 (102.08)
Regions N(%)			
Urban	65 (73%)	24 (37%)	41 (63%)
Rural	24 (27%)	13 (54%)	11 (46%)
BMI (kg/m^2)			
Mean	34.35 ± 6.18	33.72± 6.77	33.82± 6.78
Median (range)	33.5 (28)	33 (45.42)	33 (45.42)

ESR (mm/hour)		Before	After	Before	After
Mean	28.61± 19.31	21.06 ± 16.70	22.81±7.8	23.68 ± 23.57	24.81±21.4
CRP (mg/L)					
Mean	4.21±2.1	4.2±1.1	3.8±1.6	4.3±0.81	4.1±0.91

which improved to 119.35±1.5 degrees in right knee and 118.20±2 degrees in left knee joint. However, there was no statistical difference found between pre and post PRP flexion at knee joint (P=0.25). The overall pre-treatment WOMAC score was 37.0±2.9 and it reduced after PRP to 18.8±5.2. Statistically significant improvement was noted in WOMAC score after PRP in all OA grades with P value= 0.02.

The pre -treatment VAS was 8.42±0.84 that indicated severe pain. At 3 months follow up after PRP injection, VAS reduced to 4.91±2.12 which amounts to mild to moderate pain. A total of 63 (70.07%) patients were satisfied with the PRP treatment and 17 (19.1%) patients were partially satisfied. However, there were 9 (10.1%) patients who were not satisfied due to persisting pain and no improvement in the symptoms.

Discussion

In this study there was significant improvement in WOMAC score among patients who received PRP injection. The VAS also improved at three months following PRP injection in all patients. Majority of our patients were satisfied with PRP treatment. However, among a total of 89 patients, 9 were not satisfied with the treatment. Our study shows improvement of functional and clinical outcomes in 1,2 and 3 grades of OA.

Osteoarthritis is a disease which significantly involves joints and has a great impact on the quality of life and mobility of an individuals. Many new advancements have been made in the field of orthopaedics since decades. Conservative or non-surgical treatment modalities have been introduced for OA. Orthobiologics or regenerative medicine is one of the latest and most advanced method for OA therapy which is attracting a lot of attention nowadays. Among these treatment modalities, PRP injections are gaining popularity day by day.[17] However, there is still lack of authentic evidence about improvement of the functional and clinical outcomes after PRP treatment. In order to find out the efficacy and effectiveness of PRP injection in OA, we conducted this study which showed significant improvement in WOMAC and VAS scores after 3 months following PRP. Filardo G et al.[18] conducted a study to evaluate the efficacy of PRP for knee degenerative cartilage lesions. They included 91 patients and reported that PRP injection reduced pain and discomfort at the knee joints and improved functional outcomes. These findings are consistent with the results of our study. Sampson S et al.[19] conducted a single-center prospective study in which they evaluated 14 patients with PRP for primary and secondary knee OA. They had also measured cartilage thickness by ultrasound. According to their findings, pain intensity reduced in all patients however femoral articular cartilage thickness increased after 6 months of PRP injection on ultrasound at the lateral condyle, medial condyle, and intercondylar notch. In our study we did not perform any sonographic measurements of cartilage, however pain intensity reduced in all of our patients after PRP.

In another study,[20] effectiveness of PRP was evaluated in 65 patients suffering from OA. Similar to our study, it reported good clinical and functional outcomes at knee joints after PRP injection. This study also showed a statistically significant negative correlation between patient's age and PRP potential in VAS score and IKDC. In the current study, we only aimed to see clinical and functional outcomes and did not predict or compare variables with each other. Spaková T et al.[21] conducted a comparative study to evaluate the effectiveness of PRP and hyaluronic acid for knee arthritis. A total of 120 patients with grade 1, 2 and 3 knee OA were enrolled and divided into two groups. One group received three injections of PRP and the second group received three injections of hyaluronic acid. On comparing the functional outcomes, PRP group showed significantly better results than hyaluronic acid group at 3 and 6 months after PRP injections. In the present study, improvement in the symptoms were reported with better functional outcomes and reduced pain intensity. Another study was conducted to assess the outcome of

intra-articular PRP injection for knee OA and also to evaluate the impact of cycling dosing of PRP on effectiveness of the treatment.[22] They concluded that all patients significantly (P-value< 0.005) improved from pre-treatment values. At 2 years follow up, the functional score declined in both groups but remained better than pre-treatment scores with no significant difference between the two groups. However, patients with two cycles showed higher mean values of mean scores. In our study, we also injected cyclic three doses of PRP at an interval of one month. Most of our patients were satisfied with treatment and showed improvement and mobility after 3 months following PRP. According to the systematic reviews done by Khoshbin A et al.,[23] intra-articular PRP multi sequential knee injections improved functional outcomes (WOMAC and IKDC) at 24 months follow up. However, there was no benefit found between PRP and control group for other pain measures (visual analogue pain score) or over all patient satisfaction. Unlike the findings of this review, pain intensity reduced in all our patient after 3 months of treatment and majority of them were over all satisfied but we did not have any comparison group.

Limitations

There are certain limitations of this study. First, the presented study lacks a comparative group. We did not compare our findings with any other treatment for OA. Therefore, it is difficult to check the superiority of PRP for OA management between other treatment options. The study reported results after 3 months of 3 cyclic doses of PRP which is a very short duration to evaluate the long term effects of PRP on knee joint.

Recommendations

Further studies should be done with long term follow ups to observe the effectiveness of PRP with time. This study was highly dependant on patient's perception with some objective assessment. Therefore, some experimental studies should be done in future to assess the PRP efficacy in an accurate manner. However, this study can serve as a baseline for future experimental studies on the same subject.

Conclusion

PRP injection in cycling doses of three injections with 4 weeks interval is an effective way of managing knee OA symptoms. It reduces the pain intensity and improves functional outcomes at knee joint. PRP can be considered as the choice of treatment for patients with knee osteoarthritis.

Disclaimer: None.

Conflicts of Interest: None.

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